Congressional Notification Profile

DE-PS26-02NT41369

UNIVERSITY COAL RESEARCH PROGRAM, INNOVATIVE CONCEPTS PROGRAM
University of Utah

Background and Technical Information:
Project Title: "Enhanced Coal Reburning Under Oxidizing Conditions."

This project plans to reduce nitrogen oxide emissions in coal combustors by enhancing the effectiveness of reburning coal char. Studies have shown that volatiles and species of nitrogen are released when char is oxidized. The project will investigate this phenomenon by using a range of temperatures and different oxygen amounts to determine the best conditions for coal reburning.

NO_x is typically formed when oxygen interacts with nitrogen in the fuel that is released at high temperatures. Results will form the basis of a single particle model capable of evaluating optimum conditions for coal injection that maximizes NO reburning and allows for char burnout without using overfire air ports.

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Congressional District: UT 2nd County: Salt Lake

Financial Information:

Length of Contract (months): 12
Government Share: $50,000
Total value of contract: $50,000

DOE Funding Breakdown:
Funds: FY 2002 $50,000

ENHANCED COAL REBURNING UNDER OXIDIZING CONDITIONS
Dept. of Chemical and Fuels Engineering, University of Utah

ABSTRACT

The objective of this proposal is to enhance the effectiveness of coal as a reburning fuel by taking advantage of the following three mechanisms of NO reduction: 1) NO reduction by volatiles; 2) NO reduction by char; and 3) NO reduction by nitrogenous species released by char under oxidizing conditions.

The novelty of the proposal is in the third objective. The basis for the proposed effort is our previous observation that NO/char oxidation is enhanced by two orders of magnitude under oxidizing conditions, as a result of nitrogenous species evolved during oxidation that can react with NO. This augmentation has been studied over a narrow temperature window and at 4 and 20% oxygen.

It is not presently known how the reduction kinetics vary with stoichiometry over the two orders of magnitude difference between the inert and oxidizing conditions. Therefore, it is necessary to perform experiments at different temperatures and stoichiometric ratios in order to determine the optimal conditions for fuel-lean coal reburning. This region will be determined by a trade-off between the ideal temperature and oxygen concentration required to obtain maximum NO reduction, and the one needed to guarantee complete char burnout.

The proposed effort, to be carried out in a drop tube reactor modified to allow for an increase in char residence time, will determine the effect of changing oxidation conditions on the NO/char oxidation kinetics as well as charburnout. The results will be used to develop kinetic parameters for a single particle model that can be used to evaluate the optimum conditions for coal injection that will maximize NO reburning and allow for char burnout without the incremental cost of overfire air ports.

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